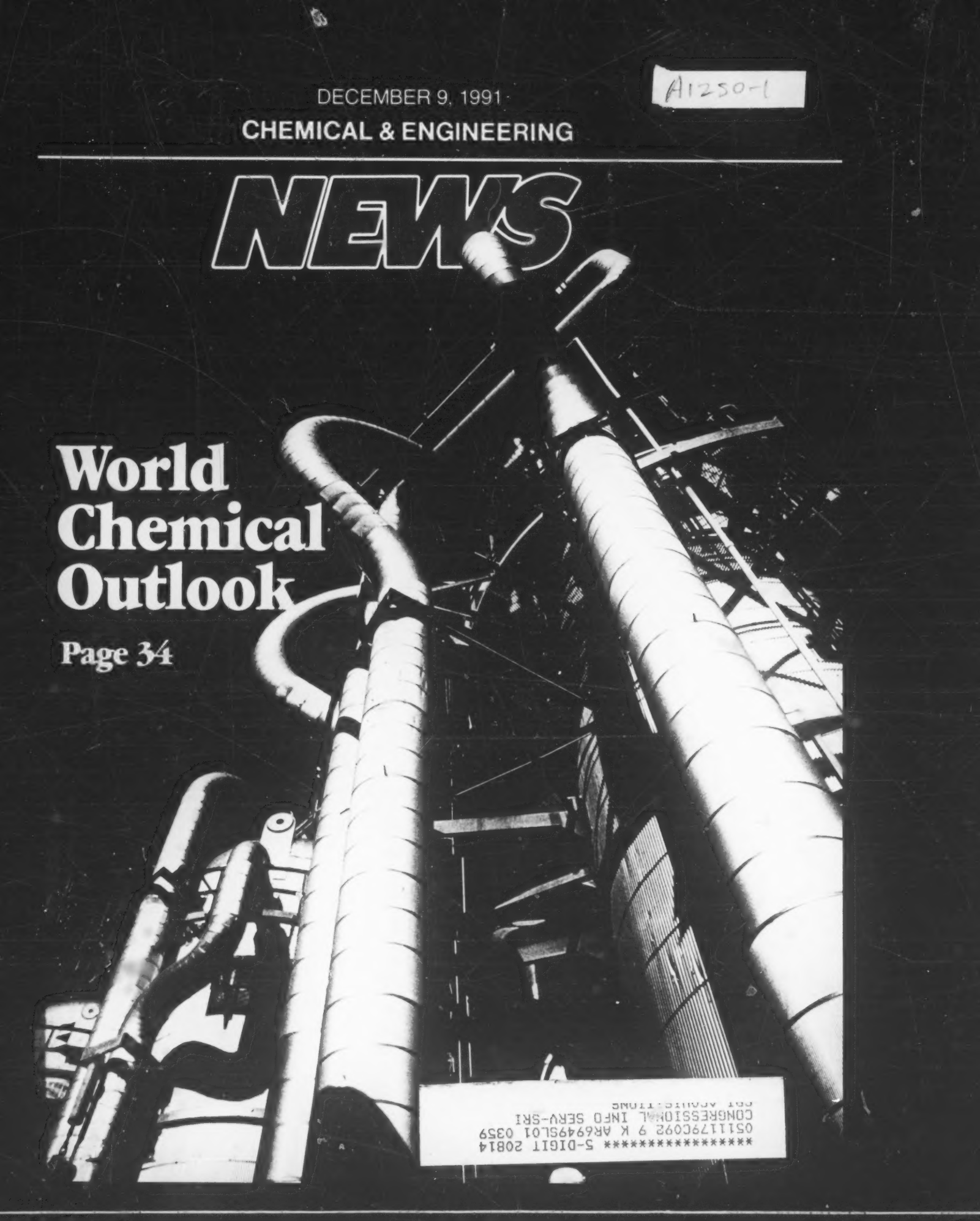
A1250-1

DECEMBER 9, 1991

CHEMICAL & ENGINEERING

NEWS



World Chemical Outlook

Page 34

**********5-DIGIT 20814
05111796092 9 K AR6949SL01 0359
CONGRESSIONAL INFO SERV-SRI

CHEMICAL & ENGINEERING
NEWS
Volume 69, Number 49
CENEAR 69 (49) 1–76
ISSN 0009-2347
DECEMBER 9, 1991

News of the Week

■ **National Academy of Sciences panel assesses future of U.S. research universities, finds heyday of science is over.** Page 4

■ **Three environmental groups petition EPA to speed up phaseout of ozone-depleting CFCs and halons.** Page 5

■ **Citing divergent business strategies, Solvay and Laporte plan to divide their joint interests in the Interox Group.** Page 5

■ **OSHA issues standard designed to protect lab and health care workers against exposure to blood-borne pathogens such as hepatitis and AIDS viruses.** Page 6

■ **International group of scientists drafts recommendations aimed at identifying the scientific knowledge base needed for environmental policy decisions in coming decades.** Page 6

Cover: Occidental Chemical's ethylene oxide reactors at Bayport, Tex., petrochemical plant

Letters 2

Concentrates
Business 7
Government 16
Science/Technology 21

The Departments
New Products 53
ACS Comment 61
ACS News 62
People 63
Awards 65
Newscripts 76

Business

Venture capital for specialty chemicals, materials firms is hard to find in current weak economy. **Page 11**

Government

Suggestions for controlling indirect costs of research got cool reception from NIH advisory panel. **Page 18**

Science/Technology

Mass spectrometry technique based on chemical reactions between molecular ion beams and surfaces could benefit surface, molecular structure analyses. **Page 22**

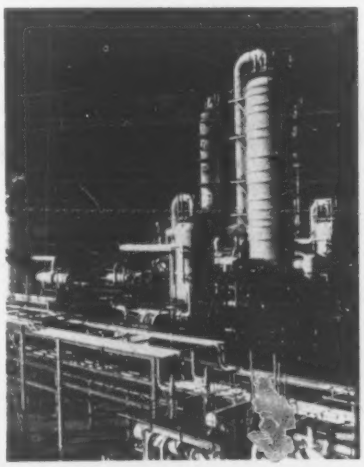
U.S., Soviet scientists hail performance of joint space project to map total ozone content in Earth's atmosphere. **Page 24**

Pressure-sensitive paint that continuously maps surface pressure on airplanes uses phosphorescent porphyrin indicator. **Page 29**

Henkel Corp.'s fellowships for two doctoral candidates in colloid and surface chemistry are available again in 1992. **Page 30**

Education

Soviet-American workshop on teaching high school chemistry, held recently in Moscow, focused on ChemCom—ACS's curriculum for students not planning science careers. **Page 32**



World Chemical Outlook

The recession that has gripped many economies around the globe, and the chemical industry as well, is showing signs of abating, although it will be well into next year before the industry climbs back to profits and profitability growth. **Page 34**

Chemical & Engineering News
1155—16th St., N.W., Washington, D.C. 20036
Editor: Michael Heylin
Assistant Managing Editors: James H. Krieger, Janice R. Long, Rebecca L. Rawls, Donald J. Soisson, William J. Storck
Staff Editor: Ernest L. Carpenter
Senior Correspondents: Earl V. Anderson, Lois Ember, Wilbert C. Lepkowski
Senior Editors: New York: Stephen C. Stinson; Chicago: Joseph Haggin; London: Patricia L. Layman; Washington: Stuart A. Borman, Doron Dagani, Bette Hileman, Pamela S. Zurer
Associate Editors: Mairin B. Brennan, Ann Marie Menting, Richard J. Seltzer
Service Departments Editor: Dolores Miner
Editing Services: Arlene Goldberg-Gist (Head), Rita E. Johnson (Editorial Assistant), Patricia Oates (Administrative Assistant)
News Bureaus: Northeast News Bureau: (908) 906-8300 Ann M. Thayer (Head), Marc S. Reisch (Associate Editor), Rachel Eskenazi (Administrative Assistant). Chicago: (708) 256-4143 Ward Worthy (Head). Houston: (713) 973-8161 Bruce F. Greek (Head), Susan J. Ainsworth, (Associate Editor). Washington: (202) 872-4495 David J. Hanson (Head). West Coast: (415) 653-3630 Rudy M. Baum (Head). **Foreign Bureau:** London: (01) 540-0414 Dermot A. O'Sullivan (Head)
Graphics and Production: Leroy Corcoran (Head), Barbara Fryer (Art Director), Linda Mattingly (Staff Artist), Diane Kelly (Costing)
Composition Systems Administrator: Vincent L. Parker. **Assistant:** Robin L. Shapiro
Business Manager: Arthur Poulos
Circulation Director: David Schulbaum
ADVISORY BOARD: Dexter F. Baker, George M. Bodner, F. Peter Boer, Will D. Carpenter, George Castro, Renée G. Ford, Ethan C. Galloway, Louis J. Glunz, Kenneth G. Hancock, Harry S. Hertz, Christopher T. Hill, Kendall N. Houk, Cynthia A. Maryanoff, Linda B. McGown, C. Bradley Moore, George B. Rathmann, David A. Shirley, Peter H. Spitz, Barry M. Trost
Published by
AMERICAN CHEMICAL SOCIETY
(202) 872-4600; TDD (202) 872-4432
John Kistler Crum, Executive Director
Robert H. Marks, Director, Publications Division
PUBLISHING BOARD: Jeanne M. Shreeve *(Chairman); Board of Directors Chairman;* Joseph A. Dixon; *President;* S. Allen Heininger; Richard L. Deming; William P. Jencks; Gary J. Long; and Louis D. Quin

Subscription & Member Record Service: Send all new and renewal subscriptions with payments to: ACS, Dept. L-0011, Columbus, Ohio 43268-0011. Correspondence and telephone calls for changes of address, claims for missing issues, subscription orders, status of records and accounts should be directed to: Manager, Member & Subscriber Services, ACS, P.O. Box 3337, Columbus, Ohio 43210; (800) 333-9511 or (614) 447-3776.

For changes of address, include both old and new addresses with ZIP code numbers and mailing label from a recent issue. Allow four weeks for change to become effective. Claims for missing numbers will not be allowed if loss was due to failure of notice of change of address to be received in the time specified; if claim is dated (a) North America: more than 90 days beyond issue date, (b) all other foreign: more than one year beyond issue date; or if the reason given is "missing from files."

Subscription Rates 1991: Printed editions: nonmembers U.S. 1 yr. $95, 2 yr. $171; outside U.S. 1 yr. $131, 2 yr. $243. Air freight rates available on request. Rates above do not apply to nonmember subscribers in Japan, who must enter subscription orders with Maruzen Co. Ltd., 3-10 Nihonbashi 2-chome, Chuo-ku, Tokyo 103, Japan. Tel: (03) 272-7211. Single copies: Current $12. Rates for back issues and volumes are available from Microforms & Back Issues Office, ACS, 1155—16th St., N.W., Washington, D.C. 20036. Back and current issues available on microfilm and microfiche. Rates on request from Microform Program, ACS.

Chemical & Engineering News (ISSN 0009-2347) is published weekly except for the last week in December by the American Chemical Society at 1155—16th St., N.W., Washington, D.C. 20036. Second-class postage paid at Washington, D.C., and additional mailing offices. POSTMASTER: Send address changes to Chemical & Engineering News, Membership & Subscription Services, P.O. Box 3337, Columbus, Ohio 43210. ACS assumes no responsibility for the statements and opinions advanced by the contributors to its publications.

Advertising Management: CENTCOM LTD.
(For list of offices see page 75)
Office of Ombudsman: (800) ACS-5558, No. 8-5
© Copyright 1991, American Chemical Society
Canadian GST Reg. No. R127571347

LETTERS

Forms of carbon

The situation with regard to the number of distinct forms of carbon is more complex than noted by James Intrater (C&EN, Nov. 4, page 5). Since 1975, the carbon societies of the U.S., U.K., France, Germany, and Japan have collaborated to define the various forms of this unique element and agree on their nomenclature.

The recommendations of the International Committee for Characterization and Terminology of Carbon have been published periodically in the journal *Carbon* [13, 251 (1975); 20, 445 (1982); **21**, 517 (1983); 23, 601 (1985); and **27**, 305 (1989)]. Currently, the list comprises some 73 forms of carbon but does not yet include the new fullerene family, linear carbyne forms, or the more controversial "chaoite."

Douglas W. McKee
Chairman, American Carbon Society
Schenectady, N.Y.

Describing chemicals' use

This is in response to the Newscripts item (C&EN, Sept. 30, page 84) on the euphemism of the year. Sidney Toby implies that the Conrail spokesman was misleading the public by referring to butane "as a light, nontoxic hydrocarbon which is commonly used for cigarette lighter fuel." Further, he says that this is analogous to calling dynamite "a relatively nontoxic material used as a labor-saving device in the mining industry."

This belief is unjustified. The statement by the Conrail spokesman gives all of the relevant information. How many people do not know that fuel burns? Certainly, the Conrail spokesman could have referred to butane as highly flammable, but does that really serve a purpose? In fact, the Conrail statement gives more information to the public than the standard description of butane a chemist would give. Namely, it gives butane's use.

The American public generally believes that industry—the chemical industry in particular—is involved in the widespread manufacture and transportation of hazardous chemicals with little or no useful purpose. It is in everyone's best interest if the chemicals are more closely associated with their end use in the public's mind. What is wrong with describing dynamite as "an explosive used in the mining and construction industry"? This is a more appropriate analogy.

By placing the letter in the Newscripts section, C&EN implies agreement with his letter. As we all know, this page is usually reserved for inane number games, misprints, and statements by public officials who believe pencils cause lead poisoning. It is ironic that this occurs in the same issue as the article on Dexter Baker, Air Products' chief executive officer. He points to a public perception that puts "toxic" in front of the word chemical and a desire by the Environmental Protection Agency "to limit phenol discharges to concentrations as low as 21μg per L" while the Food & Drug Administration allows phenol concentrations up to 1.4% in sore-throat medication. Perhaps if references to phenol included "used as an anesthetic in sore-throat preparations" we would not get such schizophrenic policies.

Alex Perkins
Marietta, Ga.

Microscale chemistry

The gentlemen from the chemistry department at Merrimack College are to be commended for their discussion of the advantages of microscale chemistry and for relating some of the history (C&EN, Nov. 4, page 5). This letter will add to that history.

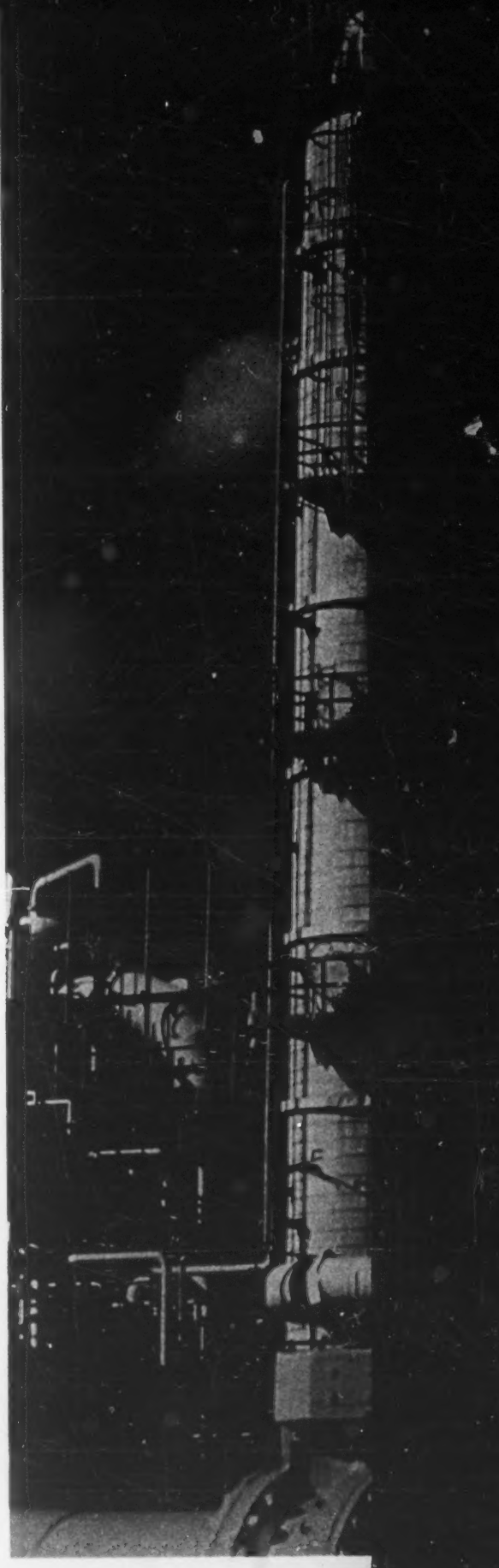
In 1946 some 18 university presidents in the state of New York, as a board of trustees, established the Associated Colleges of Upper New York (ACUNY), as suggested by then-Gov. Dewey, to provide college places for returning G.I.s.

Notice to members wishing to resign

ACS members who wish to resign their membership at the end of 1991 should do so now by letter to the ACS executive director. Bylaws specify that anyone who fails to resign by Dec. 31 will be carried on the rolls in 1992 as a member and will be responsible for dues. Failure to pay dues does not constitute a resignation.

Authorization to photocopy any article for internal or personal use beyond the fair use provisions of the Copyright Act is granted by ACS to libraries and other users registered with the Copyright Clearance Center (CCC), provided that the fee of $2.50 per article copy is paid directly to CCC, 27 Congress St., Salem, Mass. 01970, USA. Copying for other than internal or personal use without express permission of ACS is prohibited. Address requests for customized bulk reprints to ACS Copyright Administrator, 1155—16th St., N.W., Washington, D.C. 20036, or call (202) 872-4367. The CCC Code for C&EN is 0009-2347/91 $2.50.

World Chemical Outlook



The recession that has held various world economies—and the world chemical industry—in thrall for the past year may well be just about history. A number of signs point to this view.

However, the end of any economic slowdown takes time to translate itself to the chemical industry. In Canada and the U.S., the recession is just about over, although it will be sometime in 1992 before the chemical industry begins to see a return to profit and profitability growth. Europe is a little further behind, but again, 1992 probably will bring slightly improved results. Japan, on the other hand, seems to be still in the early stages of slowdown, and it has a period of yet slower growth in its future.

In 1991, foreign trade has played a key part in the fortunes of the chemical industry. In the U.S., record

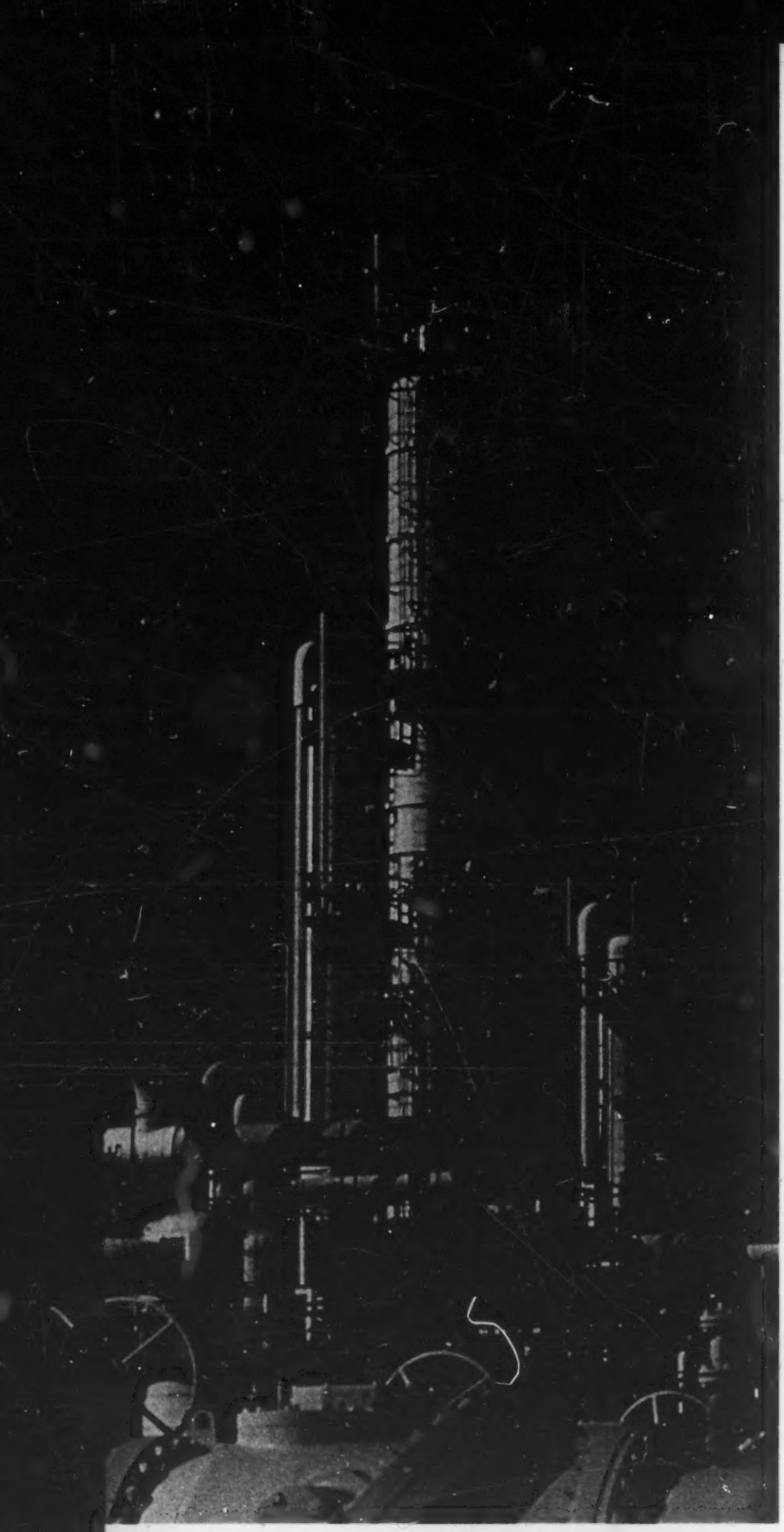
United States 37

Foreign Trade 41

Europe 45

Japan 55

Canada 59

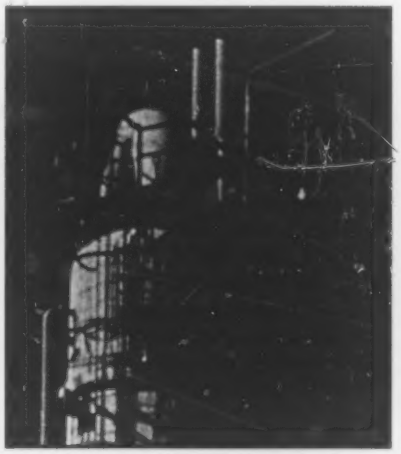


trade has buoyed shipments, helping prevent a much greater downturn. In other countries, however, the reverse has been true. Imports into these countries from the U.S. have had some adverse effects on their chemical industries. And producers, especially in Canada and Europe, are waiting for an upturn in U.S. domestic demand to pull these products out of the international marketplace.

Some realignment and restructuring of the industry also took place in 1991, with rationalization of plants, acquisitions and divestitures of businesses, and downsizing of work forces—a trend likely to continue throughout next year.

In short, 1992 promises to be a year of rebuilding for the worldwide chemical industry. It will be a year for rebuilding markets and thus sales, earnings, and profitability.

Better times ahead for chemical industry



Growth in 1992 will be slow, however, as fortunes of chemical producers lag moderately better economy

William J. Storck
C&EN Northeast News Bureau

For the past year the U.S. chemical industry has been throttled by recession, but the end may be in sight. Certainly sales are flat for the industry, and sure, earnings are down considerably from last year and the year before. Yes, profitability has taken it on the chin for the past year and a half. But by the second quarter of 1992, the industry may be looking at a better marketplace as the U.S. economy and various world outlets for its products start to improve.

The signs are there that the current recession has about run its course. Some of these indications are economic and some are psychological, but taken together they point to an upturn in the near future. Granted, the expansion that is coming will not be rapid, but rather will be the slow recovery that some people have said will have the profile of a dinner plate rather than a soup bowl or a teacup.

Taking first the most cynical, but often the most accurate, reason for the view that the recession is nearing an end: In Washington, Congress is getting into the act. Legislators, who in the past few months have learned that unemployment has risen in their home districts, are calling for economic stimulation by the executive branch. Historically, this has meant that an economic slowdown is about over. When those Senators and Representatives begin to introduce economic legislation, one can be sure the end of the recession is at hand, if not already past.

Also, chemical companies have begun a round of restructurings and reductions in force. Again, this is usually a lagging indicator as companies take time to make their plans. Big restructurings have taken place at such large chemical producers as Du Pont, Union Carbide, W. R. Grace, and Hercules as they move to trim costs and improve productivity.

In New York City, the strength of the stock market appears to bode well for the economy. Some recent precipitous declines in the market have been followed almost immediately by recoveries and renewed growth, showing an underlying strength, according to market analysts. If the market is assumed to be an efficient leading economic indicator, then this would signal a modest recovery beginning some time before the second half of 1992.

In fact, many economists are saying the recession in the U.S. is already at an end. These pundits say that, although gross national product declined in the second quarter, by the end of that three-month period, economic activity had already picked up slightly. And they believe this growth has continued through the rest of this year.

The Commerce Department also holds that view. In its earliest advance forecast of third-quarter growth in the gross national product, the Bureau of Economic Analysis predicted that constant-dollar GNP in the third quarter would be up about 0.6% from the previous three months, more than recovering the ground lost between the first and second quarters. Unfortunately, C&EN went to press immediately before the government's preliminary estimate of GNP growth was made public, so that at the time this was written, it could not be confirmed that growth did indeed take place in the third quarter.

Be that as it may, most economists are saying the end of the recession is at hand, but growth in 1992 will be lackluster. Donald H. Straszheim, chief economist at Merrill Lynch, for example, says, "Distinctly sub-par growth can be expected during 1992."

Any upturn in the economy will prove a boon for the chemical industry, but it will not see the growth rates prevalent in the late 1980s. And the chemical industry probably will lag the general economy in turning around. Indeed, if the economists are correct and the recession did end in the third quarter, then it is readily apparent from a number of indicators that chemicals are lagging. Working against a rapid upturn are a number of factors, including still weak major end-use markets. Chief among these are construction and automobiles.

Commercial construction is very weak and will continue to be so for some time as vacancy rates in office buildings remain high across the country. However, there are some hopeful signs in the residential market. While new home building continues in the doldrums, for the most part, in the U.S., resales of existing homes may be starting to move upward. In October, sales of existing homes, according to government data, increased 1% from the previous month, and were up about 2.6% from the same month in 1990 as buyers re-

sponded to the lowest mortgage rates in more than a decade.

Although this may presage an increase in new home construction and indicate that the new lower interest rates are indeed having an effect, it is also important for the chemical industry in that home buyers will want to refurbish those recently purchased houses, requiring such downstream chemical products as paints and carpeting.

The auto industry, on the other hand, seems to be chronically ill. Perhaps, at some time, lower interest rates will help spur some growth in sales, but as yet there is no indication of an upturn. Throughout the year, sales of domestically produced automobiles have been weak. In the latest reporting period of mid-November, sales of U.S.-produced cars and trucks were down almost 20% from the same period last year. This will hold down demand growth for a number of chemical products, including plastics, synthetic elastomers, and fibers.

The constraints on demand during the past year have had a number of deleterious effects on the chemical industry, including lower capacity utilization and prices. Although preliminary estimates of seasonally adjusted capacity use in the chemical industry rose slightly in October to 79.6%, it is still below the 81% measured a year earlier. Soft demand is not the only culprit here, but rather is working in combination with increased capacity from new plants, particularly in the petrochemicals segment. Some petrochemicals capacity still is expected to come on stream in the near future, thus almost guaranteeing that capacity use is not going to rebound as much as the industry would like through 1992.

Low capacity use ensures price pressure, and 1991 has proved to be no exception to this rule. Chemical producers have seen prices languishing throughout most of the year. Average prices through the first three quarters of 1991 were higher than the comparable 1990 period, but there was a price runup in the latter part of 1990 that continued into early 1991 and then abated. This came about because of fears of shortage resulting from the military buildup and impending war in the Middle East. Once these fears subsided, prices slid.

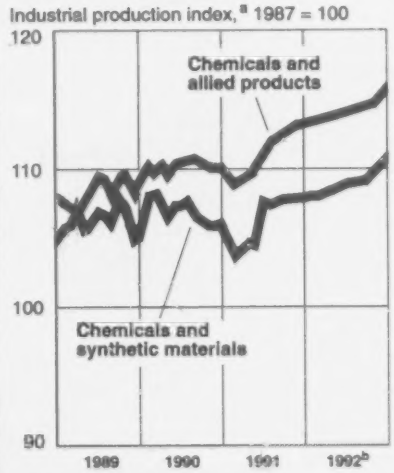
Thus the government's producer price index for chemicals and allied products through the first nine months averaged almost 3% higher than the same period last year. But the index in September was more than 3% below its value at the beginning of 1991.

For the major subcategory of industrial chemicals, price problems were even worse. The producer price index for the first nine months averaged nearly 1% above the comparable 1990 period. However, the downward trend throughout this year put September's index almost 7% below January's value.

Producers say this downward trend may well be reversing. Indeed, October price indexes reported by the government for both chemicals and allied products and industrial chemicals were higher than the previous month's. But until excess capacity is worked off, chemical makers are going to find it hard to do much more than pass along cost increases.

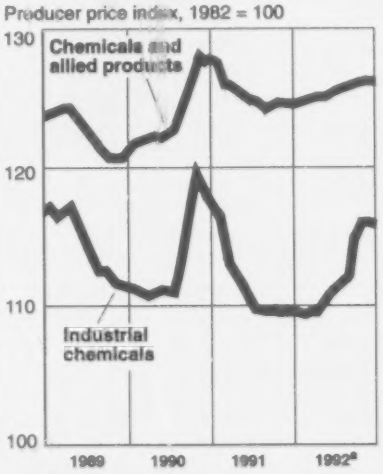
Chemical producers have been

Higher demand will spur chemical production . . .



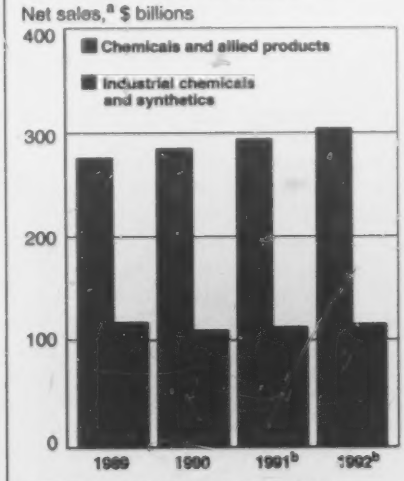
a Seasonally adjusted. b C&EN estimates.
Source: Federal Reserve Board

. . . and prices will begin to turn back up . . .



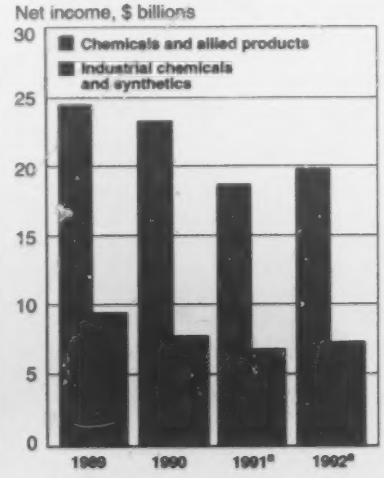
a C&EN estimates.
Source: Bureau of Labor Statistics

. . . bringing slight improvement to sales . . .



a Excludes sales of foreign affiliates. b C&EN estimates.
Source: Bureau of the Census

. . . and starting profits on the road back



a C&EN estimates.
Source: Bureau of the Census

CIRCLE 5 ON READER SERVICE CARD →

somewhat fortunate this year in that raw material costs, by and large, charted the same pattern as did selling prices—high at the beginning of the year and falling throughout the remainder. And there may be an opportunity here for producers in the near future if they can indeed raise selling prices. There is speculation by oil analysts that OPEC (the Organization of Petroleum Exporting Countries) will not soon return to production quotas for its members. This could mean a glut of oil by next spring and further lower raw material costs for chemical producers, giving them better profit margins, even in a lackluster pricing arena.

On the demand side, the chemical industry has held up fairly well through 1991, but there are some worrisome signs that demand could be weaker than the simple numbers show. Chief among these is exports and their effect on total demand.

According to government figures, the value of shipments of chemicals and allied products through the first nine months of this year totaled $218 billion, an increase of 1.8% over the same period last year. Meanwhile, industrial chemicals were weaker, with the value of shipments dropping about 1.2% to $116 billion. If the values for these two categories are deflated using their respective producer price indexes to get a rough estimate of physical volume, then chemicals and allied products declined about 2.5% in poundage and industrial chemicals declined about 2.0%. This is not bad in terms of demand in relation to the slow economy, but if the record exports are subtracted from these shipments, it means that domestic demand is certainly much weaker than is first apparent.

A good example is plastics. Using data from the Society of the Plastics Industry's Committee on Resin Statistics, shipments of the major thermoplastics—low-density, linear low-density, and high-density polyethylene; polypropylene; polystyrene; and polyvinyl chloride—in the first three quarters of 1991 totaled about 32.9 billion lb, up 1.2% from the corresponding period last year. During the same period, exports of these thermoplastics rose 45% to 4.73 billion lb. Thus, exports as a percentage of shipments have risen to about 14% through the first nine months from about 10% in the first three quarters of last year.

And if exports had held flat in 1991 from 1990, instead of rising 45%, the shipments would have been down 3.3% instead of being up a little more than 1%.

Slow recovery next year could force the industry to continue to restructure. Chemical industry employment is down about 5000 workers since the beginning of the year, and because many of the reductions in force that have been announced will not be complete until next year, employment likely will continue to head down.

In any restructuring, there also is the possibility of shifts in alignment of the industry through sales and purchases of businesses or divisions or through mergers. Thus far, little of this seems to be going on, at least above the $100 million level. And if industry sources are correct, this activity may not pick up. They say that there is plenty for sale, but the asking price is just too high.

Thus, by the end of next year, the U.S. will be looking at an industry much as it is today in terms of the players, but slightly better off in its economics with improved demand, operating rates, pricing, and, thus, profitability. □

U.S. production of most major chemicals is down, but recovery will begin next year

	1989	1990	1991	1992
INORGANIC CHEMICALS				
Thousands of tons unless otherwise indicated				
Ammonia	16,467	16,795	17,214	17,558
Chlorine gas	11,413	11,809	11,573	11,689
Hydrochloric acid	3,177	3,013	2,712	2,847
Nitric acid	8,345	8,000	7,400	7,480
Oxygen, billions of cu ft	461	462	465	471
Phosphoric acid	11,737	12,035	12,396	12,700
Sodium hydroxide	10,492	12,030	12,210	12,576
Sulfuric acid	43,301	44,044	44,250	44,803
ORGANIC CHEMICALS				
Millions of lb unless otherwise indicated				
Acetic acid	3,294	3,755	3,717	3,760
Acetone	2,524	2,221	1,800	1,872
Acrylonitrile	2,362	3,029	2,666	2,810
Benzene,[a] millions of gal	1,631	1,615	1,600	1,620
Butadiene	3,121	3,155	3,045	3,118
Caprolactam	1,307	1,379	1,296	1,321
Cumene	4,426	4,311	4,310	4,482
Cyclohexane	2,273	2,467	2,344	2,410
Ethylene	34,988	37,474	39,725	40,718
Ethylene glycol	5,461	5,027	5,278	5,440
Formaldehyde	5,893	6,412	5,963	5,903
Methanol	8,167	7,986	8,784	8,881
Phenol	3,806	3,512	2,915	3,031
Phthalic anhydride	917	941	866	912
Propylene	20,571	22,133	22,686	23,139
Styrene	8,337	8,017	7,295	7,477
o-Xylene	983	943	980	990
p-Xylene	5,344	5,200	5,408	5,450
PLASTICS				
Millions of lb				
Polyethylene, high density	8,102	8,334	8,750	9,013
Polyethylene, low density	9,695	11,176	11,567	11,856
Polypropylene	7,238	8,318	8,464	8,480
Polystyrene	5,104	5,012	4,761	4,860
Polyvinyl chloride	8,478	9,088	9,090	9,170
SYNTHETIC FIBERS				
Millions of lb				
Acrylic and modacrylic	543	506	455	473
Nylon	2,740	2,662	2,491	2,495
Olefin and vinyon	1,839	1,822	1,786	1,821
Polyester	3,594	3,195	3,339	3,456

a Petroleum refiners only. Sources: Bureau of the Census, International Trade Commission, Society of the Plastics Industry's Committee on Resin Statistics, Fiber Economics Bureau, C&EN estimates (for 1991 and 1992)

CIRCLE 5 ON READER SERVICE CARD

U.S. chemical trade enjoys record surplus

Chemical industry scores big in exports and at Uruguay round of international trade talks

Earl V. Anderson
C&EN Northeast News Bureau

The overall U.S. trade deficit will shrink below the $100 billion level this year for the first time since 1983. For this, a lot of the credit goes to the chemical industry.

U.S. chemical companies will chalk up an amazing trade surplus of close to $20 billion in 1991 on the strength of exports that will top $40 billion for the first time. This year's enviable chemical trade surplus will, of course, be a new record—the third consecutive record that the industry has set.

Meanwhile, the industry's trade representatives—are also making progress on the political front. They and their counterparts in Europe and Canada have come up with a joint plan to cut chemical tariffs in the still-unfinished Uruguay round of multilateral trade negotiations. Their chemical tariff-cutting proposal is one of the few bright spots in the long and difficult trade talks.

U.S., European Community (EC), and Canadian negotiatiors at the trade negotiations already have begun pushing this joint proposal on chemical tariffs. Developed by the Chemical Manufacturers Association, the European Chemical Industry Council, and the Canadian Chemical Producers' Association, the proposal basically agrees in principle with an earlier U.S. proposal in July 1991 to harmonize chemical tariffs at lower than current levels. That proposal called for the "global harmonization" of chemical tariffs by the world's largest chemical-producing countries.

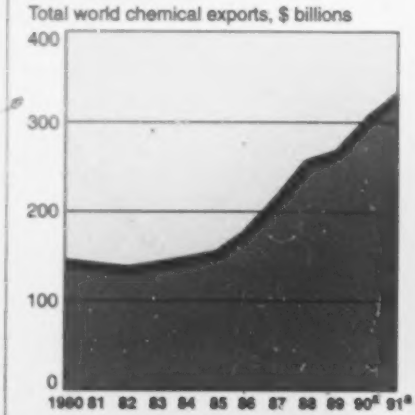
The new proposal also advocates global harmonization of chemical tariffs. But it has two caveats. First, it must receive broad country support. That is, many other countries in addition to the "largest chemical producers" must agree to it. These other countries include not only industrialized nations, but also some newly industrial nations and developing countries as well.

In fact, says one U.S. chemical trade expert, the three chemical groups that developed the chemical tariff proposal have in mind a specific list of 21 countries that are members of the General Agreement on Tariffs & Trade (GATT). The Uruguay round is being held under the auspices of GATT.

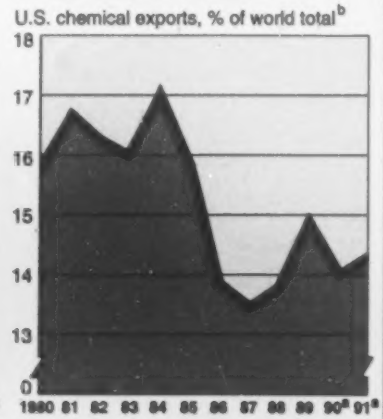
The obvious large chemical producers—the U.S., the 12 member countries of the EC, Japan, Canada, and Switzerland—are on the list. So, too, are eight developing nations (including Brazil, India, and Mexico), and two newly industrialized countries—South Korea and Singapore. If these countries—or at least most of them—do not support the chemical tariff proposal, presumably the three chemical groups that originated it will withdraw their support.

The second caveat involves linking chemical tariff cuts to reducing or eliminating nontariff measures. From the time the Uruguay round started in 1986, representatives of the U.S. chemical industry have been telling U.S. trade officials that they will not support the trade negotiations if they degenerate into a simple tariff-cutting exercise.

Another sharp rise in world chemical exports . . .



. . . as U.S. industry increases its share



a C&EN estimates. b Defined as U.S. chemical exports as percentage of world chemical exports less U.S. chemical imports. **Sources:** United Nations, Organization for Economic Cooperation & Development, European Community, Japanese Ministry of International Trade & Industry, Bureau of the Census

Plastics lead a surge in chemical exports

$ Millions	U.S. chemical exports				U.S. chemical imports			
	1991[a]	1990	1989	1988	1991[a]	1990	1989	1988
Organic chemicals	$11,449	$10,400	$10,609	$ 9,704	$ 8,341	$ 7,392	$ 7,042	$ 7,250
Plastics in primary form	7,735	6,428	5,727	5,503	1,912	1,974	1,687	1,373
Medicinals and pharmaceuticals	4,632	4,103	3,660	3,362	2,964	2,500	2,086	1,849
Inorganic chemicals	4,108	3,816	4,319	4,289	3,107	3,234	3,231	3,147
Fertilizers[b]	3,015	2,574	2,821	1,199	932	955	999	991
Plastics in nonprimary form	2,753	2,633	2,202	2,001	1,816	1,774	1,629	1,574
Essential oils, toilet, and polishing materials	2,272	1,963	1,469	1,126	1,362	1,323	1,165	1,175
Dyeing, tanning, and coloring materials	1,617	1,588	1,097	1,100	1,362	1,288	1,133	1,302
Other	6,119	5,478	4,583	3,725	2,104	2,028	1,780	1,665
TOTAL	$43,700	$38,983	$36,485	$31,909	$23,900	$22,468	$20,752	$20,326

a C&EN estimates. b Except crude of group 272. Source: Bureau of the Census

If tariffs are to be cut, the U.S. chemical industry also wants negotiators to dismantle many of the nontariff measures that keep its exports out of foreign markets. That linkage between tariffs and nontariff measures is also part of the tripartite chemical tariff proposal.

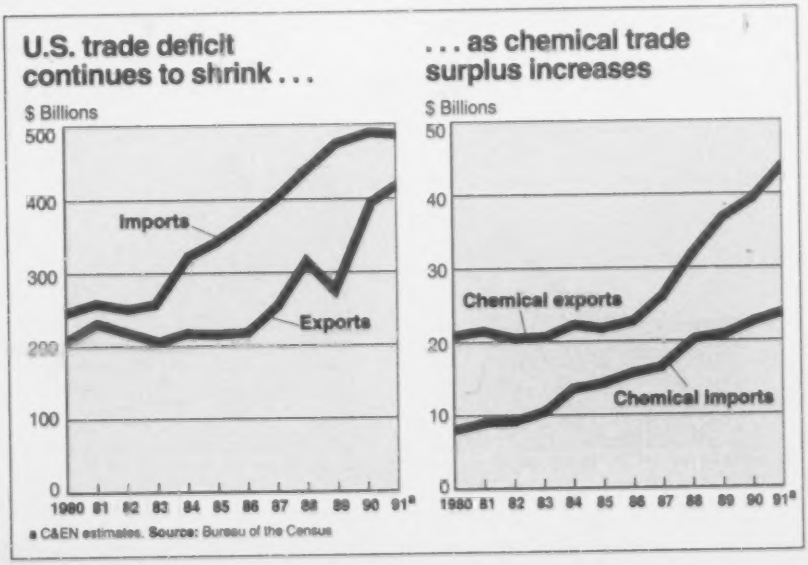
If these caveats are met, and if the negotiators at the trade negotiations ultimately reach agreement, worldwide chemical tariffs will drop considerably from current levels.

The proposal calls for present chemical tariffs of 10% or less to be cut to a level of 5.5% or 6.5% over five years, depending upon product category. Tariffs between 10 and 25% will fall to 5.5% over 10 years, while tariffs greater than 25% will drop to 6.5% over 15 years.

Tariffs that already are less than the proposed harmonization levels will remain as they are. However, the three chemical groups say that reducing tariffs below the proposed harmonization levels, including completely eliminating tariffs, is a "viable goal."

In fact, pharmaceuticals already have been proposed for so-called zero for zero treatment in the trade talks. That is, one country agrees to eliminate its duties on pharmaceuticals if other countries agree to do the same.

The U.S. pharmaceutical industry supports this concept. And proposals for similar zero for zero tariff treatment are being worked up for cosmetics, toiletries, soaps and detergents, and some fertilizers.



a C&EN estimates. Source: Bureau of the Census

The tripartite tariff proposal covers all of the products in the chemical sections—chapters 28 through 39—of the Harmonized Tariff Schedule. There are no exceptions. Every product in these 12 chapters will be treated in one of three ways: Their tariffs will be cut to the proposed harmonization level; they will be treated under the zero for zero concept; or they will be treated as "import-sensitive" products.

To qualify as an import-sensitive product, producers must justify their claims to the trade negotiators of their respective countries. Only then may the harmonization level be different than the proposed 5.5% or 6.5% levels. However, even for import-sensitive chemicals, tariffs can be cut no less than 30%, and the phase-in period cannot be more than 15 years.

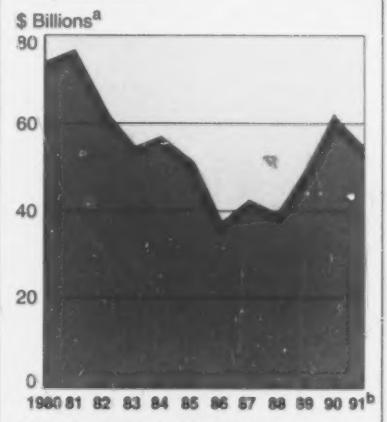
Trade negotiators, still under the gun to come up with a trade agreement almost a year after the trade talks collapsed last December, no doubt see this comprehensive, joint tariff proposal by three of the world's influential chemical trade associations as a breath of fresh air. However, they will need much more than this one, narrowly focused tariff proposal to succeed.

They have made some progress in the contentious agricultural trade negotiations, but much still remains to be done on this difficult issue. The Uruguay round also includes, among other things, negotiations on trade in services, intellectual property rights, and foreign investment.

When the trade negotiations were

U.S. oil imports will slip this year . . .

. . . pushing down the oil import bill



a All petroleum products. b C&EN estimates.
Source: Bureau of the Census

launched in 1986 in Uruguay, the U.S. chemical industry said it was concerned about four major issues: market access (including tariffs), intellectual property, investment, and subsidies. The tripartite proposal takes care of the market access concerns. Of the remaining three, at press time only a proposed intellectual property agreement looked as if it would be acceptable to U.S. chemical industry trade experts. They are not very happy about either the subsidy or investment proposals made so far.

The big question for the industry, then, is where to draw the line on what will be an acceptable trade package deal. The industry never said it would withdraw its support for a total Uruguay round agreement if it disliked, say, only one or two of the agreements it considers important. But, until top-level negotiators start making some tough political decisions, the industry's trade policy decisionmakers won't be able to answer that question or draw that line.

Meanwhile, the U.S. chemical industry can bask in the limelight of its performance on the world trade marketplace. Chemical exports this year will amount to an estimated $43.7 billion, up a healthy 12% over 1990.

Coupled with chemical imports that grew at only about half that rate—up 6.4% to $23.9 billion— that exceptional export performance gives the U.S. chemical industry a hefty $19.8 billion trade surplus for the year. That's more than $3 billion higher than last year's chemical trade surplus, itself a record at the time. And it pushes chemicals ahead of aircraft as the U.S. industry with the largest trade surplus.

Why the exceptional increase in chemical exports this year? It's difficult to credit any one thing. It's more a combination of factors. For instance, the weak economy in the U.S. put a lid on domestic chemical demand. This meant more chemical capacity available to produce products for the export market. And, compared with the U.S. economy, the economies—and hence demand—in those export markets held up fairly well.

The dollar exchange rate against the major foreign currencies fluctuated widely this year. It was a mixed blessing. Normally a weak dollar helps exports by making them less expensive in foreign markets. A strong dollar makes exports more expensive; hence, less competitive overseas. But with the dollar vacillating between strength and weakness against the other major currencies, it probably had little impact on U.S. chemical trade.

Whatever the reason, U.S. chemical exports, paced by strong increases in organics, plastics, fertilizers, and medicinals, have helped put a big dent in the country's troublesome trade deficit. U.S. exports of all products this year increased more than 6% to about $420 billion. Meanwhile, imports declined for the first time since 1982, ending the year 2% lower than last year at $485 billion, thanks in large part to a lower oil import bill.

Those higher exports and lower imports shaved $36 billion off last year's trade deficit. At about $65 billion, the trade deficit has not been that low since 1983. □

U.S. trade deficit slips below three digits

	U.S. exports				U.S. imports			
$ Billions	1991[a]	1990	1989	1988	1991[a]	1990	1989	1988
Machinery and transport equipment	$185.8	$172.5	$148.8	$135.1	$208.2	$208.0	$205.6	$197.0
Chemicals	43.7	39.0	36.5	31.9	23.9	22.5	20.8	20.3
Miscellaneous manufactures	42.9	39.3	32.6	24.5	81.6	81.5	76.5	70.4
Manufactured goods classified by material	36.2	31.7	27.2	22.8	58.3	59.9	62.0	61.5
Food and live animals	29.0	29.3	29.7	26.4	22.3	21.9	20.6	20.1
Crude materials, inedible except fuels	25.7	27.0	26.9	25.1	13.1	14.5	15.4	13.4
Mineral fuels and lubricants	11.8	12.2	9.9	8.2	55.8	64.5	52.5	41.1
Beverages and tobacco	6.7	7.1	5.5	4.5	4.4	4.6	4.4	4.1
Animal and vegetable oils, fats, and waxes	0.8	1.2	1.4	1.5	0.5	0.8	0.7	0.8
All other products	16.8	16.2	31.2	27.5	17.0	16.8	14.4	12.6
TOTAL	$420.0[b]	$394.0[b]	$364.3[b]	$322.4[b]	$485.0	$495.0	$472.9	$440.9

a C&EN estimates. b Includes reexported imports not included in individual categories. **Source:** Bureau of the Census

Recession woes to continue for chemicals

For the Western European chemical industry, 1991 has been the year in which the light at the end of the tunnel flickered and went out. And there seems to be little likelihood it will be rekindled until at least the middle of next year.

At the end of last year, when the industry had come down with a bang from two frothy years of good times and high profits, predictions were that the downturn would have worked itself out by the second half of 1991. Came the second half, however, and after a brief flash of hope, the picture became gloomily clear: Downturn became full-fledged recession, spreading slowly across the continent.

Marketing managers around the European chemical industry say the major factors influencing the European chemical industry in 1991 were the Persian Gulf War, subsequent trimming of inventories, overcapacity, and the general economic recession. The initial reaction to developments in the Middle East in 1990 was to increase inventory levels as a cushion against possible raw material shortages brought on by the conflict. In the early part of 1991, this trend was reversed, and drastic cutting of inventories exacerbated a general drop in demand caused by the economic recession. The icing on the cake: The price of naphtha feedstocks remained stubbornly high, squeezing producers' price-cost margins.

Tony Church, chemicals analyst with stockbrokers Wertheim Schroder in London, says, "I thought by August and September, the industry had found the bottom. I was wrong. The petrochemicals business now faces nine months of losses." Even downstream producers were not immune, he says. "Producers of high-value-added materials were disappointed as well. They forgot that if you are selling to the motor vehicles industry, and that industry is down 40%, you are down 40%."

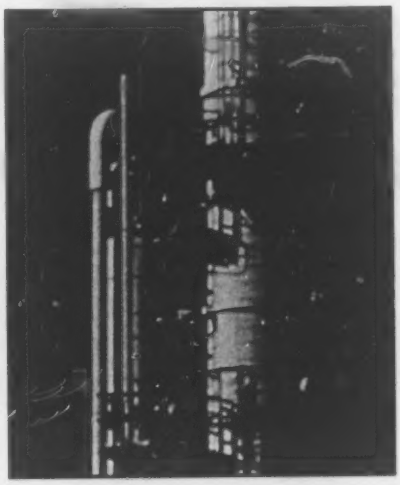
On a country-by-country basis, there clearly have been differences in performance during the year. Spurred by demand from unification, Germany had been growing strongly. On the other hand, in the U.K. growth rates slowed down substantially—but not into the red.

Similarly, some companies have been able to protect themselves from the worst effects of the downturn. Companies with significant emphasis on noncyclical products, for example, such as Bayer in Germany and Akzo in the Netherlands, have been able to limit the damage caused by the general economic conditions.

Church believes petrochemicals look very bad because they came off a high in 1988, 1989, and 1990. By the time the war in the Persian Gulf was over, demand remained high to some extent, but the problem had become one of overcapacity and supply. The result has been, among other things, that prices have been less than costs.

Without a major upturn in demand in the European market, the only answer he sees is that producers have to cut capacity, a move he sees no signs of, "although logic says they will eventually have to." Additionally, if the economy in the U.S. picks up, the extra demand there will divert the U.S.-produced material now being sold in Europe, removing some pressure on pricing.

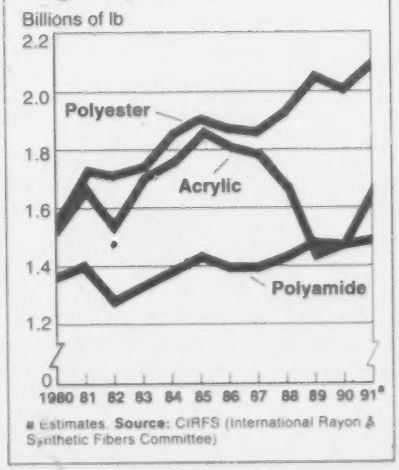
There is not much likelihood of an immediate upturn in European economies, however, says Richard D. Freeman, corporate chief economist with ICI. Speaking to chemical market researchers at the ECMRA meeting in London in October, Freeman pointed out that after several years of strong growth of real gross domestic product in many countries, their economies turned down around mid-1990, and the deceleration gathered pace in the first half of this year. With the main exception of Germany, demand and activity in Europe now seem to be strengthening again, although any recovery is rather weak and drawn out.



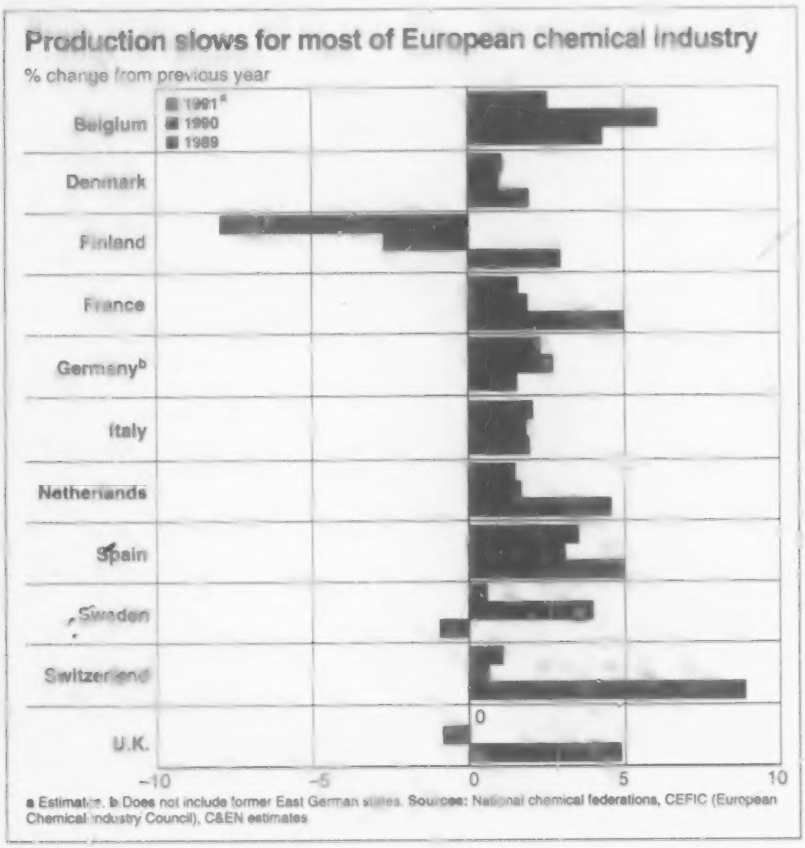
Major factors have been Persian Gulf War, inventory trimming, overcapacity; no turnaround seen till mid-1992

Patricia L. Layman, *C&EN London*

Man-made fiber production edges up in 1991



* Estimates. **Source:** CIRFS (International Rayon & Synthetic Fibers Committee)



This year, with the collapse of consumer and business confidence, investment has virtually come to a stop in the major European economies and in many of the smaller countries, and most severely in the U.K. The relatively weak position of corporate finances has been compounded in 1990 and 1991 by falling profitability. And now, even in Germany, investment is slowing down sharply.

Capital spending in the chemical industry has been trimmed somewhat—frequently mentioned is a rate of about 10%—or is just barely holding its own. There are very few examples of investment being significantly increased, unless a company has been in the midst of a major project it couldn't handily stop.

Considering these factors, chemical production in Western Europe probably will end the year about 0.5 to 1% higher than in 1990, rather than the 1.5% forecast in the first half of the year by CEFIC, the European Chemical Industry Council. The slow revival of sales and a rebuilding of stocks anticipated in the second half of the year never came through.

Neither did a general strengthening of prices come about. Companies

Chemical economies remain unsettled for Eastern Europe

At the October meeting of ECMRA, the European marketing research group, in London, Richard D. Freeman, corporate chief economist at ICI, told chemical marketing researchers what most of them already knew—that the economies of Eastern Europe are in a sad state.

Last year, for example, gross domestic product for the region fell 4.5%. This year, the drop officially is 5%, with predictions of further drops of 6% in 1992 and 4% in 1993. Not until 1994 will some sort of stability take hold, he says. However, those predictions understate the fall in activity, particularly in view of recent events in the Soviet Union. "The main messages are that the economies are very depressed and that output is expected to fall for the next two or three years at least," he adds.

That, in turn, has had a direct impact on Western European chemical companies. For example, Bryan K. Sanderson, chief executive officer of BP Chemicals, says the company's sales in Eastern Europe have been running at about $20 million per year in the past few years. The U.S.S.R. accounted for about one third of that, but its portion is down 50% this year.

In the Soviet Union, by one estimate, industrial production likely has fallen 10% or more this year, and labor productivity has dropped a similar percentage. Oil production has fallen rapidly, leading to predictions that the Soviet Union could become an oil importer before the end of the decade.

Clouding any view of Central and Eastern Europe is the seemingly humdrum field of statistics: gathering them and then interpreting their reliability when gathered.

The Organization for Economic Cooperation & Development (OECD), for example, recently acknowledged that in Eastern Europe, government statistical offices have traditionally played a very different role from that of their counterparts in OECD countries. The transition from central planning to market economy doesn't merely mean that different kinds of statistics are required, but that working practices must be rethought, as well.

Formerly, for example, statistical offices collected and published few data in monetary terms, although detailed quantitative data on production of a vast range of products were collected. Each enterprise had its own production target, so offices were required to keep track of each enterprise. And statisticians were often under pressure to "improve" data to show that planned targets were being achieved, and they were expected to perform a propaganda function.

OECD advisers now recommend that countries begin collecting the national statistics that make up gross domestic or national product, for example, such as labor-force statistics and indexes of con-

point out that chemical prices are currently below the levels of a year ago in the U.S. and Germany, and have declined in real terms in the other major economies of the U.K., Italy, Canada, Japan, and France. Moreover, competition from outside Europe has become tougher because the U.S. is actively looking for overseas markets. The weakness of the dollar and of the yen in the first part of the year enabled surplus product from the U.S. and Asia Pacific to compete in European markets while making these markets less profitable to Europeans.

Wertheim Schroder's Church notes that although plastics do not represent the whole petrochemical industry, the trend in polymer prices is typical of what is happening to a major segment of the industry. For example, the price of low-density polyethylene was 2 German marks per kg last January and it now is 1.15 marks; polyvinyl chloride was 1.60 marks per kg in January and is now 1.05 marks.

The result is not surprising. Losses are beginning to appear on chemicals' profit-and-loss accounts. BP Chemicals was the first European firm to publicly declare a third-quarter loss and, judging from both industry statistics and conversations with management, the number of firms with losses will mount in the fourth quarter, Church says.

Bryan K. Sanderson, chief executive officer of BP Chemicals, is not optimistic about this year and next. "We think recovery might be longer and slower than predicted," he says.

Sanderson is not alone in that assessment. For example, Andrew Butler, president of Dow Europe, points out, "During the past 12 months, our industry has unquestionably entered a more painful phase of the business cycle, with current margins in many sectors barely covering interest costs, let alone generating any return on equity capital.

"Right now, we are caught between price erosion in our plastics on the one hand and steadily increasing hydrocarbon costs on the other. While we deal quite well with dramatic changes in hydrocarbon cost, it would appear we have much greater difficulty dealing with the current situation of overcapacity and creeping increases in feedstock costs."

Dow Europe's contribution to the 1991 corporate profit plan will more than be met, but will still be about half its 1990 contribution, the company says. A combination of several factors, including a 10% price drop and a 4% decline in sales volume since autumn last year, have depressed profit margins. In fact, the company reports that profit margins today are 50% lower than they were in 1989.

Moving from petrochemicals to downstream businesses, however, the gloom begins to lighten. Germany's Hoechst, for example, provides some indication of this. The general economic conditions were too strong not to mar the company's performance, of course. According to Hoechst chairman Wolfgang Hilger, following a generally disappointing first half-year, business activity in the chemical industry continued to lack momentum in the third quarter. Demand was still restrained, the mood subdued.

The strongest impulses continued to emanate from the German and Asian markets. Here, too, however, Hilgar says, "we noticed signs of a slackening in demand in the course of the third quarter. In our most im-

sumer and producer prices, and business tendency surveys. Countries are asked to publish regular reports on current economic statistics at preannounced dates, no matter whether politically well timed or not.

The former East Germany has been solidly folded into the fabric of the German nation, although there is still friction between cultures and economies. A few non-German investments have been made in the five eastern states, but most have been by German companies.

For example, Wolfgang Hilger, chairman of Hoechst, says his firm will invest roughly $440 million in eastern Germany in the next few years. "We intend to make our contribution toward the reconstruction of the eastern German states."

For other countries in Central and Eastern Europe, however, caution has been the watchword of the year—and promises to remain so in the coming year as well.

Most companies probably would agree with Finnish chemical producer Kemira, for example, on the longer term opportunities in Eastern Europe: environmental investments; renovation, rebuilding and modernization of existing industry; and feedstock supplies from Eastern Europe.

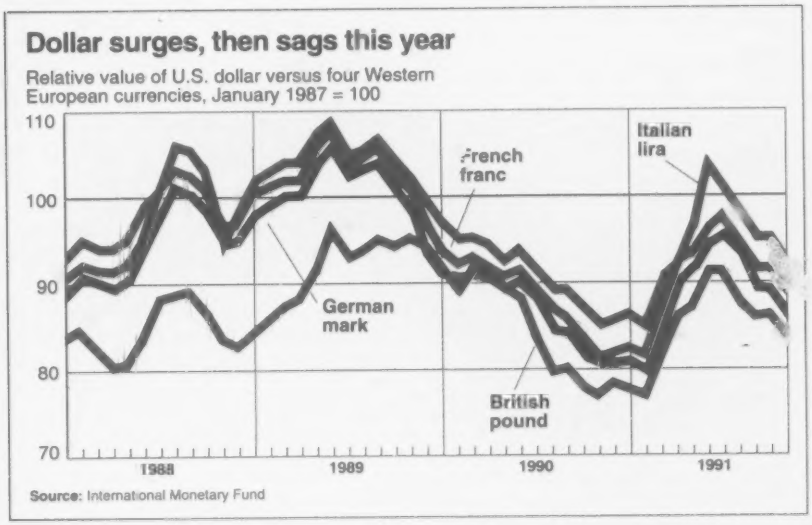
But there's also the political instability, the need to create marketing and distribution networks, and the difficulties in integrating western and eastern interests.

As officials at Shell put it, "The effect on demand from these countries will undoubtedly be positive in the longer term. In the short term, demand will be restricted by shortages of foreign exchange, but some will be met by imported products, though this will not remain the case as local modern plants are built."

A cautious approach in the short term will be the order of the day. For instance, a Unilever executive says: "Capital investment opportunities exist in all countries of the region, but our policy is to be cautious in making commitments until the direction of future political and economic development is clearer."

One answer, companies agree, is sales and marketing subsidiaries, and joint ventures, which western firms are increasingly relying on to build bridges between Western and Eastern Europe.

For example, Akzo, the Dutch chemicals producer, for a number of years has had sales organizations in Eastern Europe. But last year, it began what has become involvement with joint ventures, with a coatings venture in Hungary. Since then, it has set up another joint venture, for paper chemicals, also in Hungary. It has reached agreement in eastern Germany for cooperation with the rayon factory in Elsterberg. And in several countries of Central and Eastern Europe, the company is in contact with other prospective partners—prospective contacts that were not possible until recently.



portant market, Western Europe, business activity stagnated."

However, he adds, it's mainly the products at near-consumer level, especially pharmaceuticals, that have developed favorably in Germany. Plastics and fibers, on the other hand, are subject worldwide to heavy price pressure that is continuing unabated. And although the firm's pretax profit fell by 22%, its pharmaceuticals operations showed "an appreciable rise in profit."

That's not to say specialty producers haven't been buffeted in 1991. For example, at Unilever, whose specialty chemicals division makes up about 8% of corporate sales and 11% of operating profits, a spokesman says 1991 has been an exceptionally tough business year for chemical producers, with recession hitting particularly hard in markets in the English-speaking world. Durable goods markets such as automotive, electronics, and construction have been hardest hit, with other markets such as food and household products being less affected. And continental European markets have been less hard hit as a result of demand for consumer goods in a unified Germany and Eastern Europe.

Most major chemical companies, including those in Europe, are continuing to record weak financial results in 1991, and prospects for significant improvement in early 1992 are not strong.

"Specialty producers including ourselves are generally faring less badly with results equal to, or in some cases slightly ahead of, last year. As far as 1992 is concerned, our operating plans are based on a general continuation of weak demand for the first half with perhaps some improvement toward the end of the year," Unilever says.

Agreeing with this outlook, Sir Denys Henderson, chairman of ICI, says although economic conditions may not be deteriorating further, there is, as yet, little sign of any significant improvement in trading conditions "in most of our major markets."

The company's group profits before tax were up 22% for the third quarter. Pharmaceuticals had a record quarter, with continuing strong growth in newer products. In industrial chemicals, however, profit in chemicals and polymers was depressed by lower demand and pressure on prices, despite savings in fixed costs.

Finnish producer Kemira continued restructuring its fertilizer and paint operations during the year to enable the company to focus on its core businesses. Part of the restructuring involved divestment of noncore businesses and unsuitable parts of companies it had recently acquired. From its vantage point, European Community merger policy is not an obstacle for restructuring, although national policies and interests may affect restructuring. Kemira and other companies in countries in the European Free Trade Area (EFTA) are particularly alert to happenings in the European Community.

That has been especially true this year, which has become in essence the year of the European economic area, a free trade area made up of the 12 nations of the EC and the seven countries of EFTA.

In late October, the EC and EFTA agreed to create a new European economic market area of 380 million consumers stretching from the Arctic to the Mediterranean. Once formed in 1993, it will account for more than 40% of world trade. In 1990, the 19 countries accounted for 47% of total world exports and 46% of imports. Last year, 68% of the total trade of the 19 countries was done with other members of what will be the new European economic area, an important market that has been increasing over the past decade. For example, 58% of total EFTA exports in 1990 went to countries in the EC, compared with 53% in 1980.

By comparison, the U.S. conducted just 33% of its total trade with Canada and Mexico, partners in the new North American free trade area, in 1990; and other Asian countries accounted for just 30% of Japan's total trade, one reason for Japan's lack of enthusiasm for an Asian free trade area.

Prior to the agreement on the European economic area, EFTA countries—fearful they would be shut out of EC markets if they did not produce there—dramatically changed their patterns of foreign investment.

According to figures from the Organization for Economic Cooperation & Development, between 1982 and 1985, the EC was the destination for only 28% of foreign direct investment from EFTA countries. Between 1986 and 1988, however, this investment rose to nearly 60%. In the same period, the share claimed by North

Reprints of this C&EN special report are available in black and white at $10 per copy. For orders of 50 or more, subtract 30% from the total order cost. On orders of $50 or less, please send check or money order with request. Send orders to: Distribution, Room 210, American Chemical Society, 1155—16th St., N.W., Washington, D.C. 20036.

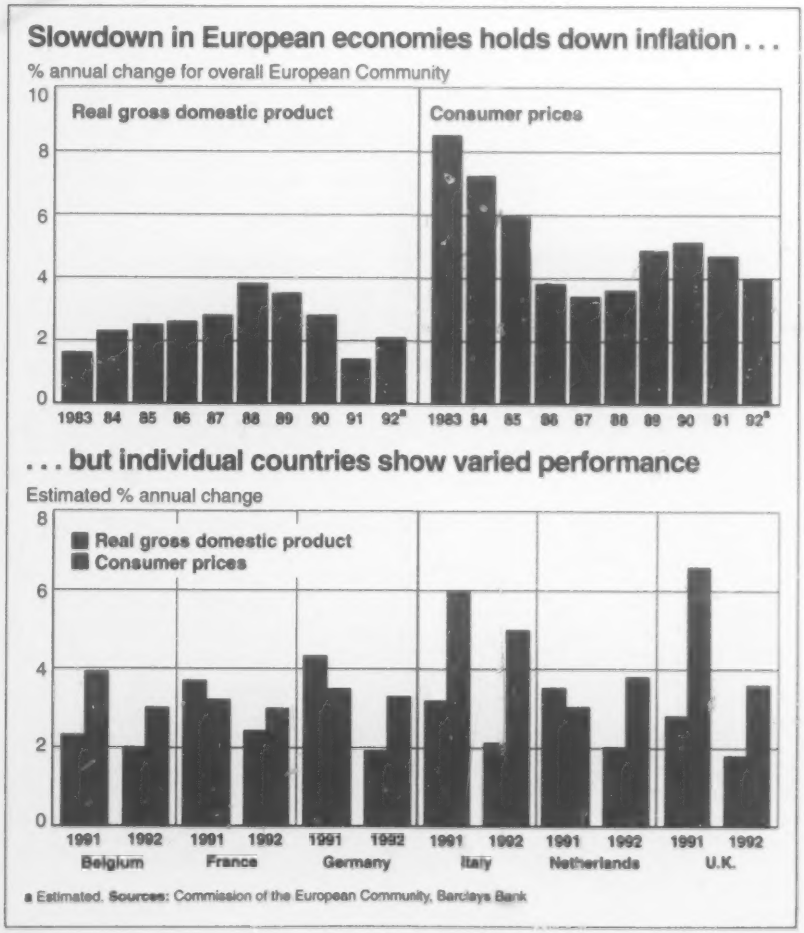
America fell from 48% to 13%. Chemicals were among the major industries buying into the EC, reflecting early concerns about free access to the EC markets.

Some of the investment has been in the petrochemical industry— buying in and building from scratch. That has helped contribute to the overcapacity that has begun to plague the industry.

"We are seeing a repetition of the early 1980s, although not quite so bad," says Peter Vogtländer, chemicals coordinator at Shell International Chemical Co. "For a mature industry, there are too many players, including some new players. The industry will have to sort itself out. We expect that a number of companies that had been holding on in 1987 to 1989—because they were making money, not because they were in core businesses—will now swap portfolios, go out of these businesses, and so on."

At a recent conference in London, J. D. (Doug) Campbell, deputy chief executive of BP Chemicals, said, "Due to the long stock chains between upstream ethylene and final consumption, we have a time lag in our system. This means that we may not see the effect of an economic recovery, which some say is beginning now, for at least a year—perhaps not until 1993. It would be grossly optimistic to expect a major recovery in demand in the near future to lead us out of our present troubles.

"We went into the 1980s with a stock of inefficient plants, but no one made any closure decisions until the blood was running in rivers of red on [profit and loss statements]. I think we would all rather not bleed this profusely again. Hard decisions need to be made again, harder than last time. It seems possible that some ethylene crackers, some integrated operations, even some entire petrochemicals sites are now in the red."



He makes two suggestions for solving the problem: one, to reduce production to levels "that more clearly match market demand," a course of action he believes may have begun; and two, to close temporarily or mothball surplus capacity.

Whatever course of action is taken something clearly must be done to relieve the industry—an industry about which David S. Glass, a director with London-based consultants Chem Systems Ltd., comments: "This is not a cyclical industry. It's an industry that doesn't usually make any money, and then every once in a while it has a hiccup."

It won't turn up unless the industry does some dramatic things, he argues, particularly since over the next 12 months, more than 1 million metric tons of new ethylene capacity is being brought on stream in Europe. This can only exacerbate conditions that have meant that, in terms of return on capital employed, profit margins in the fourth quarter are the worst in more than 15 years—and that is for the most efficient crackers.

"Everybody is losing big money" in the petrochemicals industry in the third and fourth quarters of 1991, agrees Wertheim Schroder's Church. "There is no gentle way out. If the price of oil goes up $10 tomorrow, a buyer then would have a reason to buy to hedge. However, over the past two or three months, perception and reality have come together," and the buyer holds the trump cards. "It is all well and good for producers to strut around and say they will raise prices, but they are cut down each time. The only answer can be to get capacity closed, costs down, and hunker down to wait out the recession."

Church predicts "an appalling first half in 1992, perhaps with some relief by the end of the year." The higher value-added products will be the quickest to benefit, because they are nearer to the consumer. However, it probably will be near the end of 1992 before the benefits of any pick-up in demand ripple back to bulk producers.

Without much similar action, or actual capacity cutting, however, the outlook for next year's petrochemicals industry looks much the same as this past year. □

Chemical outlook turning bleak

Economic growth in Japan is slowing down. The country's Economic Planning Agency says that, although the Japanese economy is basically sound, it is now Japan's turn to prepare for "an economic soft landing."

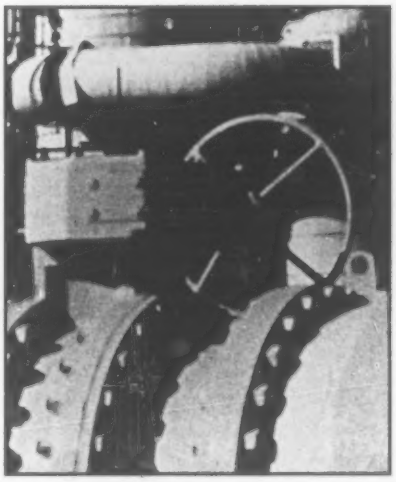
But for many of Japan's troubled chemical companies, the landing may be anything but soft. For several years, these companies have prospered as costs remained low and demand increased.

Now, the situation is reversed. Costs are rising and demand is dropping. As a result, Japanese chemical company profits are going to take a hit—in some cases a big hit.

One harbinger of things to come is the financial results of Japanese chemical giant Mitsubishi Kasei. For the first half of fiscal 1991 (April 1991 through September 1991), the company's sales dropped 3.4%. But its unconsolidated pretax profits plunged a whopping 54%.

As a result of this poor performace, Mitsubishi Kasei has lowered its profit projections 42% for the full fiscal year. Sales projections have been lowered a more modest 5%.

Mitsubishi Kasei will not be alone. C&EN indexes based on the expected results of 12 major Japanese chemical companies indicate that, although sales will remain virtually flat in fiscal 1991, net income will be down an average 9 to 10%. Among the other chemical companies that anticipate lower profits this year: Mitsubishi Petrochemical, Mitsui Petrochemical Industries, Mitsui Toatsu Chemicals, Showa Denko, and Sumitomo Chemical.



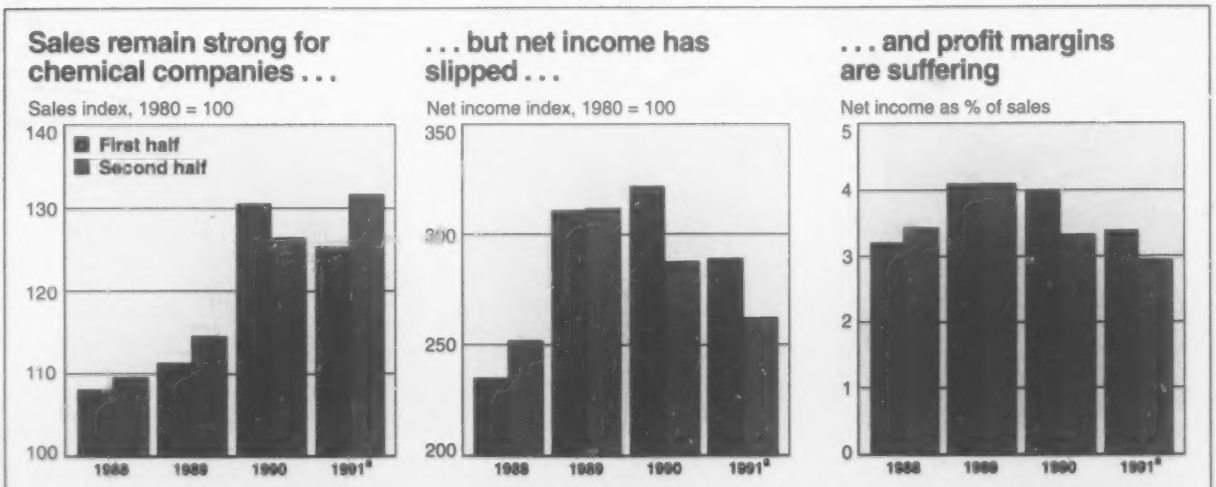
Sluggish demand coupled with rising costs means stagnant sales, lower profits for Japanese companies

Earl V. Anderson
C&EN Northeast News Bureau

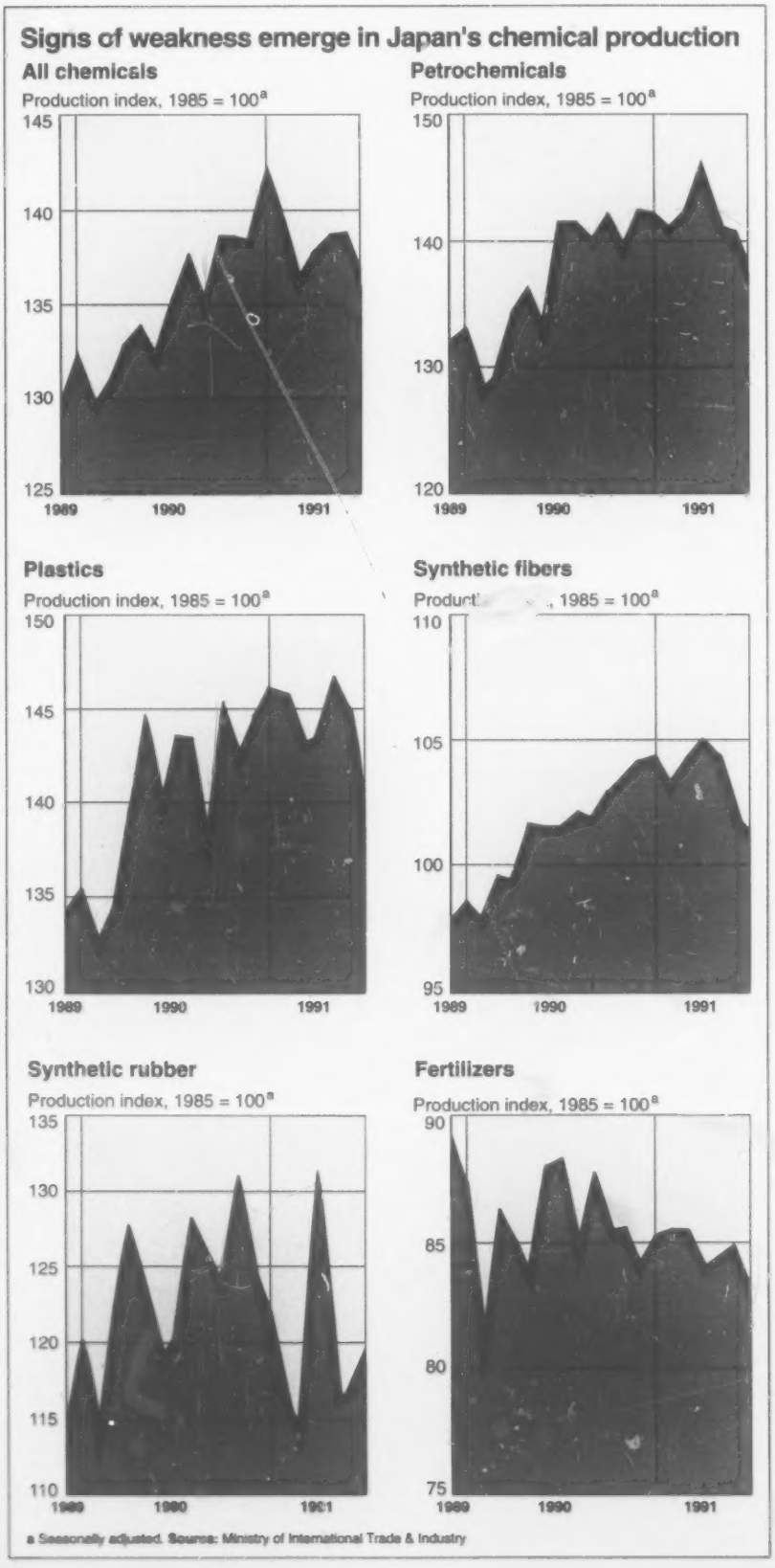
This is not what executives of Japanese chemical companies expected at the beginning of the year. Then, the consensus was that sales would increase modestly and profits would, at worst, remain flat.

That's not the consensus now. A recent survey by the Japan Petrochemical Industry Association finds that recent shipments of some key petrochemicals have been declining. It is certainly true of the major plastics, such as both low- and high-density polyethylene, polyvinyl chloride, polystyrene, and polypropylene.

Another survey—this one by the Japan Chemical Industry Association (JCIA)—mirrors the pessimism. It portrays Japan's chemical business as "increasingly stagnant" and says the



Note: Based on the results of 12 leading Japanese chemical companies: Asahi Chemical Industry, Dainippon Ink & Chemicals, Hitachi Chemical, Mitsubishi Kasei, Mitsubishi Petrochemicals, Mitsui Toatsu Chemicals, Sekisui Chemical, Showa Denko, Sumitomo Chemical, Takeda Chemical Industries, Teijin, and Toray Industries. The fiscal year for most, but not all, of these Japanese companies ends March 31 of the following year. a Estimated for second half. Source: Toyo Keizai



business slump will spread from petrochemicals to organics, end-products, and other sectors of the chemical industry.

Many replies to the JCIA questionnaire say business conditions will continue to deteriorate and the "recessionary mood" will remain until the middle of next year. The chief culprits are sluggish sales of passenger cars and household appliances and the low number of new housing starts.

Adding to their profit problems is the relatively high price of naphtha, the major petrochemical raw material in Japan. Naphtha prices shot up after Iraq invaded Kuwait. They have since gone back down, but they still remain higher than pre-Persian Gulf War levels.

Ironically, because naphtha prices have retreated following the Persian Gulf War, customers are pressuring chemical producers to lower their prices. Many are gradually, if reluctantly, responding, says Masahiko Furukawa, president of Mitsubishi Petrochemical.

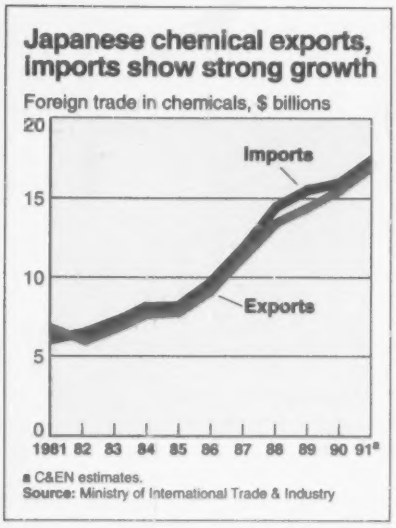
This disappointing business outlook only started to surface late in the year. Through August, there were relatively few major chemicals whose production was much lower than it was last year. Among the most notable are benzene, acrylonitrile, cyclohexane, methanol, and several inorganics.

Until August, many of the major petrochemicals held up very well. Polyethylene output was up almost 20%. And production of polystyrene, polypropylene, and polyvinyl chloride had increased between 2 and 6%. Ethylene production responded with a 7% gain.

Since August, it has been a different story. Petrochemical demand usually increases after September. But petrochemical producers report that demand has remained sluggish. According to very preliminary figures, 10 of the 17 major petrochemicals suffered an average 10% drop in production in October.

As a result, producers are trying to reduce inventories and lower costs. And they are fighting hard to keep prices up in the face of declining demand.

But production cutbacks seem inevitable. And they may last for some



time. In the face of these new realities, Japanese chemical companies are trying to keep plant operating rates as high as possible by pushing exports, particularly to China and to Southeast Asia. They apparently are succeeding. This year, Japan's chemical exports likely will increase almost 10% to $17.4 billion.

Meanwhile, chemical imports also are rising. They likely will increase about 11% this year to $17.8 billion. Japan has had a chemical balance of trade deficit for the past nine years, but it all but disappeared last year. This year, however, deficit will jump back up to an estimated $450 milion.

The Japanese chemical export drive, however, could be sailing into rough water. South Korean petrochemical producers have put a lot of new capacity on stream recently. And they are eyeing the same export markets that Japanese chemical companies are.

Korean petrochemicals could even become a competitor for Japanese companies in their home market. And, to make matters worse, as Korean naphtha demand increases, naphtha prices probably will go up, tightening the cost-price squeeze on Japanese petrochemical producers even more.

Capital spending and personal consumption have been the twin engines that have fueled Japan's economic expansion. Both are weak now. In fact, capital spending in Japan is projected to decline in the next fiscal year starting April 1992. It will be the first annual decline in six years.

Most Japanese companies cite economic uncertainty as the primary reason for their spending cutbacks. And this uncertainty will have an impact on the Japanese chemical industry.

Typical of this impact is Asahi Chemical's decision to scrap plans to expand its Chiba polystyrene plant. Asahi has 330,000 metric tons of polystyrene capacity and had planned a 50,000-metric-ton increase by next October. But, faced with declining polystyrene demand and increased worldwide capacity, Asahi opted out of the expansion.

Meanwhile, several ethylene producers have started cutting back on production. Tosoh Corp. has decided to delay for one year the startup of its planned, 400,000-metric-ton ethylene plant until the spring of 1995.

There no doubt will be more production cutbacks and more scrapped expansion plans before Japan's economic "soft landing" is over. □

Output of ethylene and derivatives remains healthy

Thousands of metric tons unless otherwise indicated	1990	Seven months 1991	Seven months 1990	% change
INORGANIC CHEMICALS				
Ammonia	1831	960	1047	−8%
Ammonium chloride	246	147	147	0
Ammonium sulfate	1803	1052	1059	−1
Calcium carbide	294	190	183	4
Calcium superphosphate	472	256	289	−11
Carbon black	783	464	394	18
Chlorine, liquid	1042	615	609	1
Hydrochloric acid	637	291	350	−17
Nitrogen[a]	8299	5038	4733	6
Oxygen[a]	8787	5255	4998	5
Sodium carbonate	1135	658	664	−1
Sodium hydroxide	3917	1971	2257	−13
Sodium silicate	788	308	441	−30
Sulfuric acid	6887	4155	4000	4
Titanium dioxide	280	161	164	−2
ORGANIC CHEMICALS				
Acetaldehyde	384	222	212	5
Acetic acid	462	247	251	−2
Acetone	334	206	199	4
Acrylonitrile	593	305	339	−10
Benzene[b]	2768	1492	1708	−13
Butadiene	827	498	475	5
Butanol	300	184	164	12
Caprolactam	509	314	300	5
Cyclohexane	629	332	382	−13%
Dioctyl phthalate	295	178	143	25
Ethylene	5810	3535	3307	7
Ethylene dichloride	2660	1539	1529	1
Ethylene glycol	501	354	255	39
Ethylene oxide	674	371	391	−5
Methanol	84	53	62	−15
Octanol	283	165	149	11
Phenol	403	268	244	10
Phthalic anhydride[b]	161	89	94	−5
Propylene	4215	2551	2402	6
Propylene glycol	298	171	170	1
Styrene	2215	1334	1179	13
Terephthalic acid	1338	858	738	16
Toluene	1078	639	611	5
Toluene diisocyanate	116	74	56	32
Urea	776	438	362	21
Xylene	2652	1652	1511	9
PLASTICS				
Phenolic resins	385	227	222	2
Polyethylene	2888	1726	1444	20
Polypropylene	1942	1137	1096	4
Polystyrene	2097	1240	1173	6
Polyvinyl chloride	2049	1190	1162	2
SYNTHETIC RUBBER	1426	809	824	−2

a Millions of cubic meters. b Petroleum-based product only. Source: Ministry of International Trade & Industry

Chemical firms expect another tough year

Technically, Canada's recession ended in the first quarter. But you would be hard-pressed to get many Canadian chemical executives to agree. And you certainly never would know it from the sales and earnings statements of many Canadian chemical companies.

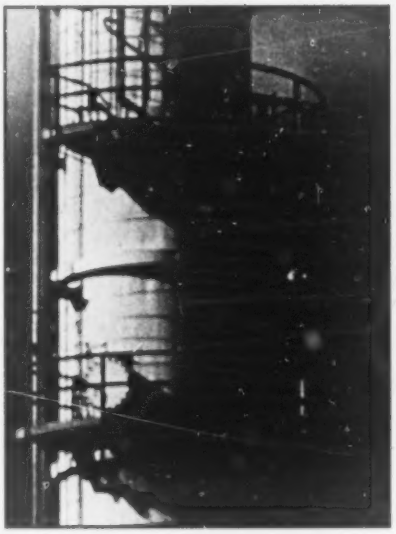
For most of them, lower sales and earnings were the order of the day during the first half of the year. It was not until the third quarter that they started to see some improvement in their bottom lines.

Even then, the improvement was not enough to overcome the losses Canadian chemical companies chalked up in the first half. And even though some leaders in the Canadian chemical industry think that sales and earnings will continue to improve in the fourth quarter, they concede that the improvement will be nothing to brag about. Many Canadian chemical companies still will be left with red ink for the entire year.

It's not difficult to find the reasons. The domestic economy has continued to be weak in Canada, even though the recession may have ended early in the year. That has meant weak domestic demand for chemicals. Indeed, chemical shipments have been running about 3% lower in 1991 than last year. Even August's chemical shipments (the latest month for which data are available) were still 3.4% below year-end levels of 1990.

Along with weak shipments comes weak prices. Canadian chemical producers have contended with weak prices all year. And the inevitable result of lower shipments and lower prices is lower sales and earnings. Only recently have prices begun to recover for some products that are the mainstays of the Canadian chemical industry.

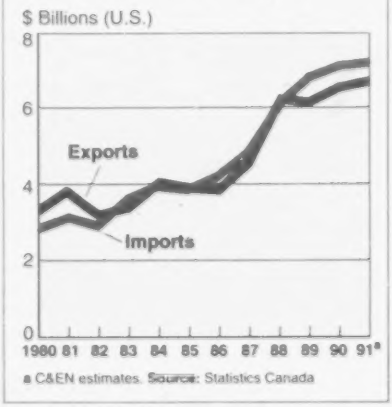
Even the Canadian dollar has had a negative impact on the country's chemical producers. The Bank of Canada has kept the Canadian dollar very strong to combat inflation in the country. But a strong currency tends to penalize exports and stimulate imports.



Weak domestic demand and lower prices spell lower sales and earnings for many producers

Earl V. Anderson
C&EN Northeast News Bureau

Little change in Canada's chemical trade this year



a C&EN estimates. Source: Statistics Canada

That's not a welcome situation for the Canadian chemical industry. It, and especially the petrochemical sector with its large, world-scale plants, is heavily export-oriented. DuPont Canada, for instance, exports more than 55% of its production.

Partly as a result of the strong Canadian dollar, Canadian chemical exports this year probably will increase only 0.2% to about $6.7 billion in U.S. dollars (1.7% in Canadian dollars). Another reason for the listless export performance is the weak economy in the U.S. About 70% of Canada's chemical exports end up in the U.S.

Meanwhile, Canadian chemical imports will decline 0.4% this year to $7.2 billion in U.S. dollars (they will actually increase 1.2% in Canadian dollars). True, the strong Canadian dollar would be expected to result in a stronger growth in chemical imports. But its impact has been partially offset by the country's weak economy.

Faced with this inhospitable market climate, output of most Canadian chemicals will decline this year, with very few exceptions. Two of the most notable exceptions, however, will be high-density polyethylene (HDPE) and sodium chlorate.

HDPE is one of the very few products that has been blessed with a strong export market. As a result, output probably will be up this year about 20% to 440,000 metric tons.

Other major petrochemicals won't be that fortunate. Output of low-density polyethylene (LDPE) will be down almost 8%, and polystyrene production will shrink a hefty 21%.

Nitrogen fertilizers continue to be hard hit. Ammonium nitrate output probably will end the year about 8% lower than last year; production of ammonia and urea will be down 2.1% and 1.2%, respectively. Not surprisingly, output of sulfuric acid, a

Very few chemicals buck the production downtrend

Thousands of metric tons	Production 1991[a]	1990	1989	1988	1987	% change 1990–91
Ammonia	3550	3602	4054	4012	3512	−2%
Ammonium nitrate	950	1031	1056	990	844	−8
Benzene	640	765	670	695	720	−16
Chlorine	1410	1542	1592	1664	1635	−9
Ethylene	2510	2425	2317	2346	2140	4
Hydrochloric acid, 100%	185	187	180	180	164	−1
Nitric acid, 100%	910	965	1027	919	900	−6
Polyethylene, high density	440	364	303	311	269	21
Polyethylene, low density	1075	1167	1039	1105	1021	−8
Polystyrene	170	215	196	216	197	−21
Propylene	740	766	719	672	628	−3
Sodium chlorate	715	658	593	503	432	9
Sodium hydroxide	1500	1651	1679	1720	1770	−9
Sulfuric acid	2895	3311	3560	3805	3437	−13
Toluene	380	427	397	417	396	−11
Urea	2460	2490	2402	2372	4142	−1
Xylene	425	514	432	399	345	−17

a C&EN estimates. **Source:** Statistics Canada

reliable barometer of both the industrial and agricultural chemical markets, will be 13% lower than last year.

All of these factors—weak domestic demand, lower production, weak prices, a strong Canadian dollar, and lackluster exports—are apparent in the performance of many Canadian chemical companies. Celanese Canada is a good example.

Typical of many Canadian chemical companies, Celanese Canada garnered higher sales and earnings in the third quarter but, through the first nine months, net income still was lower than it was last year. One reason, according to the company: "The weak domestic market and heightened competition from imports due to the high value of the Canadian dollar" hurt its polyester business.

DuPont Canada also scored slightly higher sales and much higher earnings in the third quarter, yet managed to stay in the red for the first nine months. Some of those lower earnings were caused by depressed world prices for polyethylene and lower domestic volumes.

Nova Corp. of Alberta, which depends heavily on commodity petrochemicals, has been particularly hard hit this year. Through the first nine months, chemical sales and earnings are down 32% and 94%, respectively. Nova blames an industrywide squeeze on prices for much of its chemical profit problems.

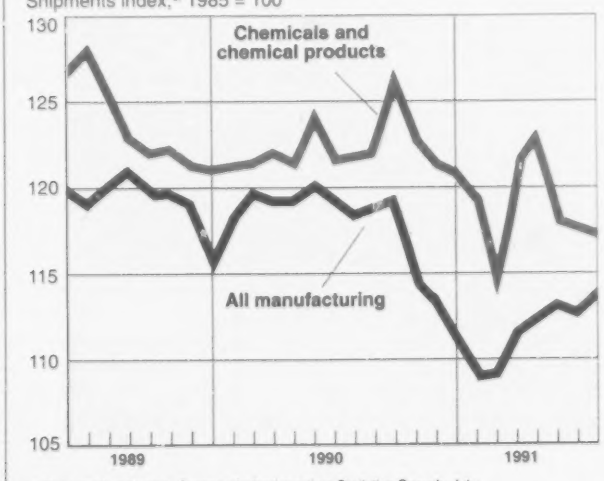
Nova expects prices to stabilize as the North American economy recovers from recession. "If" it recovers is probably a safer way of saying it. Even if it does, the economy will not become an instant worldbeater.

D. John Ogren, president and chief executive officer of DuPont Canada, notes that the "level of economic activity" is still extremely weak. "We expect this recovery will continue to be mild," he says. And future export growth will depend upon the strength of the U.S. recovery.

Alban W. Schuele, president of Celanese Canada, says the speed at which the economy is expected to recover from recession "is uncertain." When this quarter's results are in, he expects them to be better. But he also expects that the strong Canadian dollar will continue to put pressure on the company's export earnings and lead to stiffer competition in the domestic market from imports.

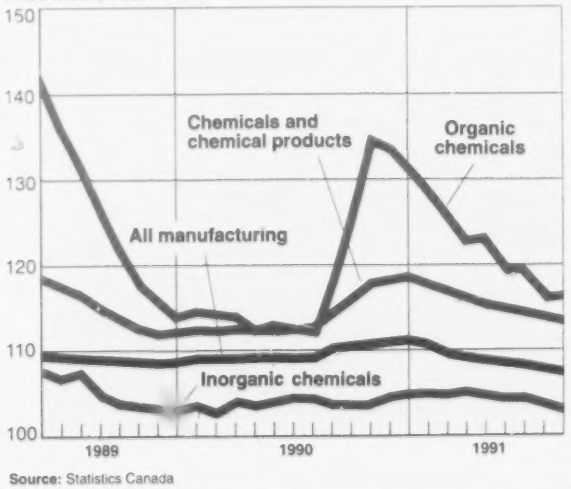
Apparently, next year will be a better one for Canadian chemical companies. But not much better. □

Chemical shipments remain weak . . .



a Seasonally adjusted. **Source:** Index based on Statistics Canada data

. . . as do chemical prices



Source: Statistics Canada